

SOIL SAMPLE PROCURING TOOL AND ASSOCIATED METHOD OF  
TESTING THE SOIL SAMPLE

BACKGROUND OF THE INVENTION

5           The invention relates generally to soil sampling,  
to tools for extracting a soil sample from the ground,  
and to methods of procuring and handling a soil sample  
until subsequent analysis.

10           The invention also relates to methods and  
apparatus for procuring and handling soil samples  
containing volatile components, such as gasoline or  
other ground contaminants.

          Attention is directed to the following U.S.  
Patents:

- 15           4,498,547, Herkness, II, issued February 12, 1985  
          4,790,392, Clements, issued December 13, 1988  
          4,809,790, Manchak, Jr., issued March 7, 1989  
          4,946,000, Gibson et al., issued August 7, 1990  
          4,989,678, Thompson, issued February 5, 1991  
20           5,038,624, Clay, issued August 13, 1991  
          5,050,425, Robbins, issued September 25, 1991  
          5,140,845, Robbins, issued August 25, 1992  
          5,186,263, Kejr et al., issued February 16, 1993  
          5,343,771, Turriff et al., issued September 6,  
25           1994  
          5,344,781, Kitchen et al., issued September 6,  
          1994  
          5,384,262, Piasio et al., issued January 24, 1995  
          5,450,913, Mefferd et al., issued September 19,  
30           1995  
          5,505,098, Turriff et al, issued April 9, 1996  
          5,517,868, Turriff et al., issued May 21, 1996  
          5,522,271, Turriff et al., issued June 4, 1996  
          5,587,538, Bratton, issued December 24, 1996  
35           5,606,139, Wittig et al., issued February 25, 1997

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Attention is also directed to the following publications:

5        "Modified DRO Method for Determining Diesel Range Organics", pp. 1 - 26; PUBL-SW-141; Wisconsin DNR, September 1995

      "Modified GRO Method for Determining Gasoline Range Organics", pp. 1 - 33; PUBL-SW-140; Wisconsin DNR, September 1995

10       Chapter NR 149 (NR 149.03) "Laboratory Certification and Registration", pp. 365 - 367, Register, November , 1996, No. 491

      NR 700.11 "Sample Preservation and Analysis", Wisconsin Administrative Code NR 700.11, page 6, Register, February, 1997, No. 494

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#### SUMMARY OF THE INVENTION

20       The invention provides a method for taking a soil sample, which method comprises the steps of providing a hollow member having an open end, forcing the open end of the hollow member into the ground to locate a soil sample in the hollow member, ejecting the soil sample from the hollow member and into a sealable vial, sealing the vial, thereafter injecting methanol or other suitable organic material capturing agent into  
25       the vial without opening the vial, and thereafter analyzing the contents of the vial.

30       The invention also provides a method of taking a soil sample, which method comprises the steps of providing a hollow member having an open end, a plunger housed in the hollow member, and a sealable vial having a self-sealing penetrable part, forcing the open end of the hollow member into the ground to locate a soil sample in the hollow member, promptly ejecting the soil sample from the hollow member by the plunger and into  
35       the sealable vial, promptly sealing the vial, thereafter injecting through the penetrable part a first quantity of methanol into the vial, shake for fifteen seconds and thereafter adding to the vial a

second quantity of methanol, if necessary, such that the total volume of methanol in milliliters in the vial is equal to the weight in grams of the soil sample in the vial, and analyzing the contents of the vial.

5           The invention also provides a tool for withdrawing a soil sample, the tool including a frame member having spaced upright legs and a foot portion fixed to the lower ends of the legs. The foot portion includes a slot adopted to removably house a horizontal flange  
10       projecting from the upper end of an elongated hollow cylindrical member. The elongated cylindrical member is open at its lower end and is adapted to be forced into the ground. In one form of the invention, the elongated cylindrical member can be a syringe having  
15       the end removed. The tool also includes a plunger member housed in the elongated hollow cylindrical member and having an upper projecting end located between the legs of the frame member. The plunger is supported for slideable movement within the hollow  
20       member and includes an upper end engageable with the abutment portion of the frame member to restrict the extent of upward movement of the plunger member during insertion of the tubular member into the ground. The apparatus of the invention also includes a vial for  
25       receiving a soil sample from the elongated cylindrical member, the vial including a removable cap having a septum. The septum is intended to permit injection of methanol or other organic capturing agent into the vial without opening the vial.

30           Other features and advantages of the invention will become apparent to those skilled in the art upon review of the following detailed description, claims and drawings.

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Figure 1 is a perspective view of a tool for withdrawing a soil sample, which tool incorporates various of the features of the invention.

Figure 3 is a side elevational view, partially in section, of a portion of the tool shown in Figure 1.

Figure 5 is a perspective view of a vial or container employed in a method in accordance with the invention.

15 Before one embodiment of the invention is explained in detail, it is to be understood that the invention is not limited in its application to the details of the construction and the arrangements of components set forth in the following description or  
20 illustrated in the drawings. The invention is capable of other embodiments and of being practiced or being carried out in various ways. Also, it is understood that the phraseology and terminology used herein is for the purpose of description and should not be regarded  
25 as limiting.

Shown in Figure 1 of the drawings is a tool 11 for withdrawing a soil sample 13, which tool 11 comprises a frame member 15 including an inverted U-shaped handle or guard portion 17, an elongated hollow member 19 adapted to be inserted into the ground and extending downwardly from the frame member 17 and, a plunger member 21 located, in part, within the frame member 15 and, in part, for slideable movement within the hollow member 19.

More particularly, the frame member 15 can be fabricated of any suitable strong and rigid material, such as plastic or metal, and includes horizontally spaced upright legs 23 and 25 having upper and lower ends 27 and 29, and a bridge 31 connecting the upper ends 27 of the legs 23 and 25.

In addition, the frame member 15 includes a foot portion 35 fixed to the lower ends 29 of the legs 23 and 25 and including, as best shown in Figure 4, an outer perimeter 37 extending laterally beyond the spaced legs 23 and 25 and a slot 39 defined by a vertically extending wall 41. The slot 41 includes an entry part 45, and a semi-circular part 47 which extends from the entry part 45 and is located between the legs 23 and 25. More particularly, while other constructions can be employed, in the disclosed construction, the vertically extending wall 41 includes a pair of horizontally spaced straight and parallel portions 51 and 53 which define the entry part 45 and which include inner ends 55, and a semi-circular portion 61 which defines the semi-circular part 47 and which extends about an axis 63 and from the inner ends 55 of the straight portions 51 and 53 of the vertically extending wall 41.

The slot 39 also includes a groove 71 which is located in the vertically extending wall 41 and which extends horizontally. More particularly, while other constructions can be employed, in the disclosed construction, the groove 71 includes a pair of horizontally spaced straight and parallel portions 73 and 75 which are respectively located in the straight portions 51 and 53 of the vertically extending wall 41 and which respectively include inner ends. Still more particularly, the straight portions 73 and 75 of the groove 71 respectively include inner vertically extending straight wall surfaces 83 and 85 spaced horizontally from the straight portions 51 and 53 of the vertically extending wall 41 at a first distance.

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The elongated hollow member 19 can be fabricated of any suitable material and, in the disclosed construction, is fabricated of clear plastic material and is preferably sturdy and thin walled. While other constructions can be employed, in the disclosed construction, the elongated hollow member 19 is cylindrically shaped and includes an axis which, when the hollow member 19 is assembled with the frame member 15, is coincident with the axis 63. Still more particularly, the elongated hollow member 19 includes (see Figure 2) an inner cylindrical wall or surface 111, open upper and lower ends 113 and 115, and a flange 119 extending horizontally outwardly from the upper end 113 and removably located in the groove 71 formed in the slot 39 of the foot portion 35 of the frame member 15.

More particularly, while other constructions can be employed, in the disclosed construction, the flange 119 includes a pair of horizontally spaced straight and parallel edges 121 and 123 which are horizontally spaced at a distance slightly less than the horizontal spacing between the straight wall surfaces 83 and 85 of the groove 71. In addition, the flange 119 includes a pair of opposed circular edges 125 and 127 which extend from and between the straight edges 121 and 123 in concentric relation to the axis of the hollow cylindrical member 19 and which are spaced horizontally from the axis of the cylindrical member 19 at a distance slightly less than the horizontal spacing of cylindrical wall surface 91 of the groove 71 from the axis 63 of the semi-cylindrical part 47 of the slot 39 in the foot 35 of the frame member 15.

If desired, a legend 129 indicating the volume of the soil sample 13 can be provided axially on the elongated hollow member 19.

The plunger member 21 can be fabricated of any suitable material and, in the disclosed construction, is fabricated of clear plastic material and includes

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In addition, the vial or container 175 includes an interiorly threaded cap portion 181 which can be tightly threaded on the mouth 179 of the container portion 177 to seal the contents of the container or vial 175. Preferably, the cap portion 181 is provided, in the top surface thereof, with a self-sealing diaphragm or septum 185 which can be penetrated by an injection needle.

After the soil sample is deposited in the container portion 177, the cap portion 181 is immediately threaded on the container portion 177 to seal the container or vial 175.

Thereafter, the sealed container or vial 175 is transported to a laboratory for analysis of the soil sample 13. The diaphragm 185 is pierced by a hypodermic needle, twenty-two gauge or less, (not shown) and a quantity of methanol or other capturing agent is injected into the vial or container 175, which quantity preferably is sufficient to capture any volatile component in the soil sample 13. The vial can then be opened to add to the container or vial 175 a further volume of methanol so that the total volume in milliliters of methanol is approximately equal to the weight in grams of the soil sample 13. The vial can then be stored until analysis of the soil sample.

Thus, the above described tool 11 is employable in a method of taking a soil sample, which method comprises the steps of providing a hollow member having an open end, forcing the open end of the hollow member into the ground to locate a soil sample in the hollow member, displacing or ejecting the soil sample from the hollow member and directly into a sealable container or vial, promptly sealing the container or vial, thereafter injecting methanol or capturing agent into the vial without otherwise compromising or disturbing the sealed condition of the vial or container and thereafter analyzing the contents of the vial.

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In a preferred embodiment, the method further includes injecting a sufficient quantity of methanol into the vial that the volume of methanol in milliliters in the vial is approximately equal to the weight in grams of the soil sample in the vial.

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Various of the features are set forth in the following claims.

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